

MATH FIELD DAY 2006 RELAYS

**Relay A**

- A1. Find the  $x$ -coordinate of the point on the line  $y = 2x - 5$  whose  $y$ -coordinate is 1.
- A2. Let  $k$  be the number you receive. Find the area of the isosceles triangle that has two sides of length 5 and a base of length  $2k$ .
- A3. Let  $k$  be the number you receive. Find the remainder you get when you divide  $k + 2000$  by 17.
- A4. Let  $k$  be the number you receive. Calculate the value of  $k^3 - 5k^2 - 16k + 80$ .
- A5. Let  $k$  be the number you receive. If the interior angles of a regular polygon measure  $6k^\circ$ , how many sides does the polygon have?

1. 3

2. 12

3. 6

4. 20

5. **6**

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**Relay B**

B1. Solve the equation  $\sqrt{2^x + 1} = 3$ .

B2. Let  $k$  be the number you received. How many negative numbers satisfy the equation  $x^k = 3kx$ ?

B3. Let  $k$  be the number you received. Find the hypotenuse of a right triangle with two legs of lengths  $k + 4$  and  $7k + 5$ .

B4. Let  $k$  be the number you received. Find the greatest common divisor of  $k - 1$  and  $\frac{3k + 1}{k - 3}$ .

B5. Let  $k$  be the number you received. Find the probability (as a fraction) that, when tossing  $k$  fair coins all at once, a total of  $k$  heads turn up.

1. 3

2. 1

3. 13

4. 4

5.  $\frac{1}{16}$

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**Relay C**

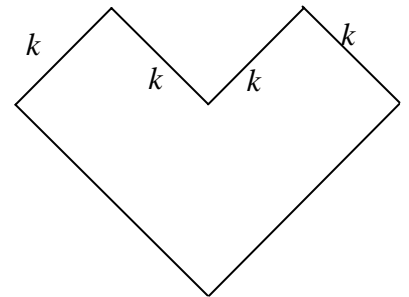
C1. Find the smallest common factor larger than 1 of the numbers 30 and 42.

C2. Let  $k$  be the number you receive. Evaluate the expression  $\frac{3+k}{9-k^2}$ .

C3. Let  $k$  be the number you receive. Find the product of  $k$  and the largest prime factor of 30.

C4. Let  $k$  be the number you receive. Find the  $y$ -coordinate of the intersection of the lines  $x + y = 4$  and  $y = kx - 2$ .

C5. Let  $k$  be the number you receive. Find the area of the shape shown at right, if all angles are right angles.



1. 2

2. 1

3. 5

4. 3

5. 27

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**Relay D**

D1. Solve the equation  $5^{2x} - 5^x = 0$ .

D2. Let  $k$  be the number you receive. Find the larger  $y$ -intercept of the circle with center  $(0, 12)$  that passes through the point  $(0, k)$ .

D3. Let  $k$  be the number you receive from the front and  $h$  be the number you receive from the back. If  $x^2 + y^2 = k$  and  $xy = \frac{h}{2}$ , find  $(x + y)^2$ .

D4. Let  $h$  be the number you receive. Find the  $y$ -coordinate of the point where the line with slope  $h$  and  $y$ -intercept 5 intersects the line with equation  $x = 10$ .

D5. How many revolutions does the hour hand on a standard clock make in a day?

1. 0

2. 24

3. 49

4. 25

5. 2